

WHAT IS CLAIMED AS NEW AND DESIRED TO BE SECURED BY LETTERS

PATENT OF UNITED STATES IS:

1. A printer-system that creates a plurality of dots and thereby prints an image on a printing medium, said printer-system comprising:

5 a head configured to produce N different dots having different densities per unit area, where N is an integer of not less than 2;

an input unit configured to input tone data with respect to each of the pixels included in an original image;

Sub 10 a threshold value storage unit configured to store a plurality of threshold values according to possible tone values that the input tone data may take, wherein each of P of the N different dots have plural respective threshold values assigned in relation to plural tone values, where P is an integer satisfying $2 \leq P \leq N$;

15 a multi-valuing unit configured to determine an on-off state of a dot and which of the N different dots is to be created in each pixel, based on density data obtained by error diffusion distribution of an error, representing a difference between a density to be expressed in a processed pixel and a density expressed by a dot actually created in the pixel, into unprocessed pixels; and

a dot creation unit configured to drive said head and create the N different dots having different densities per unit area, based on results of the determination.

20 2. A printer-system in accordance with claim 1, wherein the corresponding threshold values are set to cause a creation ratio of the P different dots to smoothly change against the

input tone value.

3. A printer-system in accordance with claim 2, wherein the creation ratio represents a ratio of a density expressed by a specific dot, which is selected out of P different dots and created in a certain tone range, to a density to be expressed by the input tone data.

5 4. A printer-system in accordance with claim 1, wherein at least two of the corresponding threshold values are set to an identical value in a specified input tone range.

5. A printer-system in accordance with claim 1, wherein a difference between the corresponding threshold values has a plurality of turning values according to the input tone value.

6. A printer-system in accordance with claim 1, wherein said head enables creation of two different dots having different ink quantities and the corresponding threshold values include a greater threshold value and a smaller threshold value.

7. A printer-system in accordance with claim 2, wherein the creation ratio takes significant values only in a continuous tone range, which is part of the possible tone values that the input tone data may take.

8. A printer-system in accordance with claim 7, wherein the creation ratio in a lower limit of the continuous tone range is set to be different from a specific tone value, at which

the creation ratio of the P different dots abruptly changes when the corresponding threshold values are set to fixed values irrespective of the tone value.

9. A printer-system that creates a plurality of dots and thereby prints an image on a printing medium, said printer-system comprising:

a head configured to produce N different dots having different densities per unit area,
where N is an integer of not less than 2;

an input unit configured to input tone data with respect to each of the pixels included in an original image;

a multi-valuing unit configured to determine an on-off state of a dot and which of the N different dots is to be created in each pixel, based on density data obtained by error diffusion distribution of an error into unprocessed pixels, said error representing a difference between a density to be expressed in a processed pixel and a density expressed by a dot actually created in the pixel;

a dot creation unit configured to drive said head and create the N different dots having different densities per unit area, based on results of the determination; and

a noise addition unit configured to add preset noise data to either one of the input tone data and at least part of the plurality of threshold values, prior to the determination by said multi-valuing unit.

10. A printer-system in accordance with claim 9, wherein said noise addition unit adds the preset noise data only when the input tone data coincides with a predetermined tone value, and wherein the predetermined tone value used in said noise addition unit is set equal

to a specific tone value, at which a creation ratio of P different dots abruptly changes, where P is an integer satisfying $2 \leq P \leq N$.

11. A printer-system in accordance with claim 9, wherein said noise addition unit adds first noise data to either one of the input tone data and at least part of the plurality of threshold values, prior to the determination by said multi-valuing unit, said noise addition unit adds second noise data which has a greater absolute value than the first noise data, instead of the first noise data when the input tone value coincides with a predetermined tone value.

12. A method of creating a plurality of dots and printing an image on a printing medium with a head that enables creation of N different dots having different densities per unit area, where N is an integer of not less than 2, said method comprising steps of:

- (a) inputting tone data with respect to each of pixels included in an original image;
- (b) referring to data that stores a plurality of threshold values according to possible tone values that the input tone data may take and determining the plurality of threshold values, wherein each of P of the N different dots have plural respective threshold values assigned in relation to plural tone values, where P is an integer satisfying $2 \leq P \leq N$;
- (c) determining an on-off state of a dot and which of the different N dots is to be created in each pixel based on density data obtained by error diffusion distribution of an error, representing a difference between a density to be expressed in a processed pixel and a density expressed by a dot actually created in the pixel, into unprocessed pixels; and
- (d) driving said head and creating the N different dots having different densities per

unit area, based on results of the determination carried out in said step (c).

13. A method of creating a plurality of dots and printing an image on a printing medium with a head that enables creation of N different dots having different densities per unit area, where N is an integer of not less than 2, said method comprising the steps of:

(a) inputting tone data with respect to each of pixels included in an original image;

(b) determining an on-off state of a dot and which of the N different dots is to be created in each pixel based on density data obtained by error diffusion distribution of an error, representing a difference between a density to be expressed in a processed pixel and a density expressed by a dot actually created in the pixel, into unprocessed pixels;

(c) driving said head and creating the N different dots having different densities per unit area, based on results of the determination carried out in said step (b); and

(d) adding preset noise data to either one of the input tone data and at least part of the plurality of threshold values, prior to the determination carried out in said step (b).

14. A recording medium in which a program for driving a printer is recorded in a computer readable manner, said printer creating a plurality of dots and thereby printing an image on a printing medium, said program causing a computer to attain the functions of:

referring to data, which stores a plurality of threshold values according to possible tone values that input tone data may take, and determining the plurality of threshold values corresponding to the input tone data, the plurality of threshold values including corresponding threshold values that correspond to at least two different dots having different densities per unit area; and

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determining an on-off state of a dot and which of the N different dots is to be created in each pixel based on density data obtained by error diffusion distribution of an error, representing a difference between a density to be expressed in a processed pixel and a density expressed by a dot actually created in the pixel, into unprocessed pixels;

5 15. A recording medium in which a program for driving a printer is recorded in a computer readable manner, said printer creating a plurality of dots and thereby printing an image on a printing medium, said program causing a computer to attain the functions of:

determining an on-off state of a dot and which of the N different dots is to be created in each pixel, based on density data obtained by error diffusion distribution of an error, representing a difference between a density to be expressed in a processed pixel and a density expressed by a dot actually created in the pixel, into unprocessed pixels; and

adding preset noise data to either one of the input tone data and at least part of the plurality of threshold values, prior to the determination.